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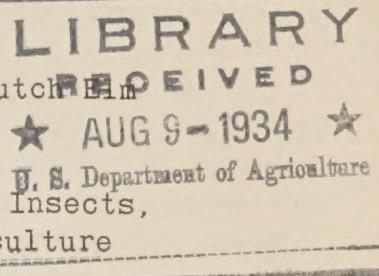


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ENGRAVER BARK BEETLES ATTACKING ELM TREES AND ASSOCIATED  
WITH THE DUTCH ELM DISEASE

A Memorandum for Technical Workers Assigned to Dutch Elm Disease Control Operations

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(NOT FOR PUBLICATION)

Any attempt at controlling the Dutch elm disease (Graphium ulmi) must have as a part of its objective the reduction of the engraver-beetle population in the infected area and, if possible, the eradication of the bark beetles within this area. In order to combat the engraver beetles effectively, it is necessary to know what the beetles and their markings on the wood and bark look like and how the beetles live.

In Europe the Dutch elm disease is reported to be transmitted from one tree to another by engraver bark beetles. One of these European elm bark beetles, Scolytus multistriatus Marsh., occurs in the area at present infected by the Dutch elm disease in the United States, and it would not be surprising at any time to find another European bark beetle species (Scolytus scolytus Fab.) here. There is likewise an American species of engraver bark beetle, Hylurgopinus rufipes (Eichh.), infesting elms in the infected region. Experimental proof that the engraver bark beetles inoculate elms with the Dutch elm disease in this country is still wanting, but there is no reasonable doubt but that these insects are largely and possibly entirely responsible for the presence and spread of the disease in the New York metropolitan area.

The life history of these European elm bark beetles is not well known in Europe and still less known in America, so there remains much work to be done on this subject. This work has already been started in New Jersey.

The Life and Seasonal History of Scolytus multistriatus

Chapman, working on Scolytus multistriatus at Cambridge, Mass., some years ago, came to the conclusion that there was only one generation a year of this insect. Eichhoff in Germany states that this beetle may or may not complete two generations a season. Gillanders in England believes that there are two generations in southern England and only one in northern England. Liese and V. Butovitch, from their own work and from a review of the literature, think that two generations are the rule, with a possible third generation in warmer climates.

Both European work and our own incomplete observations in this country indicate that some of the beetles are in flight at all times during the warm months. In Germany two periods of concentrated emergence have been observed,

and in Holland three flights in one season have been reported. We are likely to find similar variations in this country, due both to differences in climate and to seasonal differences in different years.

From our present knowledge, Scolytus multistriatus, the smaller European bark beetle, apparently spends the winter in the full grown or nearly full grown larval stage. In May and June (and probably considerably earlier) the young adults emerge and fly to healthy trees, where they feed for some time on the young twigs before they are ready to deposit their eggs. It is this feeding of the young adults that makes them very dangerous as disease carriers. If they come from a tree infected with Graphium, they carry with them the spores of the disease, both on their exterior coats and in their digestive canals. These spores are introduced into the feeding burrows and the tree becomes inoculated with the disease.

When full fed the young beetles enter the trunk or branches of a broken tree, or one weakened by disease or otherwise, and there make galleries lengthwise or with the grain of the trunk or branch infested. The entrance burrow is almost always at the lower end of the egg gallery. The eggs of S. multistriatus are laid in little pits or niches cut along the sides of the egg gallery. The larvae hatching from the eggs make smaller mines extending out at right angles to the parent gallery. Thus the egg gallery of the parent insect and the mines of the young diverging from it produce an engraving on the wood and bark that resembles quite distinctly the shape of the house centipede, or "thousand legs".

If Dutch elm disease is prevalent, the infected trees are almost sure to be chosen by the beetle for breeding places. Thus the presence of the disease furnishes more numerous and suitable breeding places for the insect and results in an increased beetle population, and the presence of numerous bark beetles emerging from such diseased material results in the inoculation of more trees--a vicious and ever-widening circle!

#### The Appearance of Scolytus multistriatus, its Feeding Work on the Twigs, and its Breeding Galleries in the Bark of Elm Trees

The appearance of this beetle is shown in figures 1 and 2. Note the "horn" or protuberance extending to the rear from between the hind legs. The breeding galleries are shown in figures 7 and 9, and the feeding injuries to the twigs in figure 10.

#### The Life and Seasonal History of Scolytus scolytus

The other European elm bark beetle likely to be found in this country is called the larger elm bark beetle (S. scolytus). In Europe this species is considered the most important vector of the Dutch elm disease. It is a much more aggressive insect than the smaller species (S. multistriatus) and is often solely responsible for the death of trees. The establishment of S. scolytus in this country would be a very serious matter. At present it is not known to be established in America, but it has been intercepted several times on elm

logs from France at several ports--New York, Baltimore, Norfolk, New Orleans. Scouting for this species as well as S. multistriatus is to be conducted.

The life history of the larger elm bark beetle is similar to that of its smaller sister species, and similar gaps in our knowledge concerning it exist. The adults are in flight at most times during the warmer months, with usually two periods of greater numbers.

#### The Appearance of *Scolytus scolytus*

This beetle is illustrated in figures 3 and 4. Note the larger size and the absence of the "horn" or protuberance extending to the rear from between the hind legs.

#### The Life and Seasonal History of *Hylurgopinus rufipes*, the American Bark Beetle of Elm

According to Chapman, this species has one generation a year and possibly a second or partial second generation. The adults make egg mines somewhat like those of S. multistriatus, but these are usually more strongly curved and they are generally situated transversely or across the grain on the branch or trunk, and not longitudinally, as is the case with the European engraver bark beetles of elm. There are usually two arms or egg galleries, one of which is generally longer and more irregular than the other. The eggs are laid, as in the case of the other bark beetles, in niches cut along the sides of the egg gallery. The larvae hatching from the eggs make smaller mines extending out at right angles to the egg galleries. Apparently the insect usually passes the winter in the adult stage.

#### The Appearance of *Hylurgopinus rufipes*

This beetle (see figures 5 and 6) is smaller than either of the European bark beetles treated above. It is also distinctly dull in finish, whereas Scolytus scolytus and S. multistriatus are both glossy in texture, especially on the thorax. The breeding galleries are shown in figure 8.

#### Conditions under which the Elm Engraver Bark Beetles are Likely to be Found

The three bark beetles discussed are secondary enemies of trees. They attack, by preference, weakened, dying, or recently dead trees for breeding purposes. In searching for infested material, the following types of trees and parts of trees should be examined for engraver beetle infestation:

Trees infected with the Dutch elm disease.

Trees that are down--especially those that have fallen during the past year, and particularly wind-blown or ax-felled trees.

Branches broken off--especially those broken off during the past year.

Trees that show evidence of injury due to drought or poor site.

Trees that have dead or dying tops.

Trees that have considerable suckering along the main branches.

Areas below and near a dead limb or part of limb.

Areas about a serious trunk or branch injury.

Trees that show woodpecker work.

Trees that have brittle twigs or twigs sharply bent back away from the branch beyond them.

Lightning-struck trees.

Wood piles--individual as well as community.

#### Control of the Engraver Beetles

In attempting to control the Dutch elm disease, it is necessary to combat the bark beetles treated above. The method of control should consist of the removal and destruction of infested material and the removal of suitable beetle-breeding material within the infected area. Infested bark should be destroyed immediately. Uninfested material that is suitable and attractive for breeding might well be left for several weeks after the first spring flight of the beetles, but it most certainly should be destroyed before a new brood of beetles can develop. This uninfested but attractive and suitable elm wood can thus be made to serve as a trap for the beetles issuing in the spring. It should be left to serve this purpose, however, only with the distinct understanding that it will be burned at the proper time.

#### Explanation of Illustrations

Figure 1. Dorsal view of Scolytus multistriatus.

Figure 2. Lateral view of Scolytus multistriatus.

Figure 3. Dorsal view of Scolytus scolytus.

Figure 4. Lateral view of Scolytus scolytus.

Figure 5. Dorsal view of Hylurgopinus rufipes.

Figure 6. Lateral view of Hylurgopinus rufipes.

(Figures 1 to 6 are much enlarged, but the enlargement (10 diameters) is the same in each case, so the sizes of the insects are comparable.)

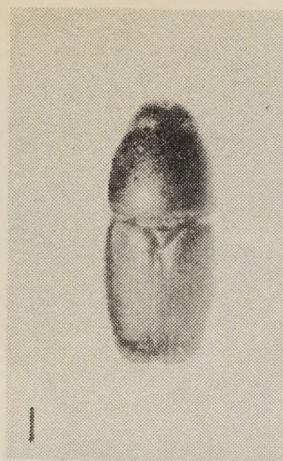
Figure 7. Drawing of the galleries of adult and immature Scolytus multistriatus. (After Chapman.)

Figure 8. Drawing of the galleries of adult and immature Hylurgopinus rufipes. (After Chapman.)

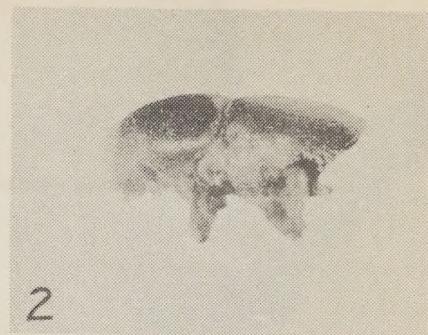
Figure 9. Galleries of adult and immature Scolytus multistriatus.

Figure 10. Feeding injuries to twigs produced by young adults of Scolytus multistriatus.

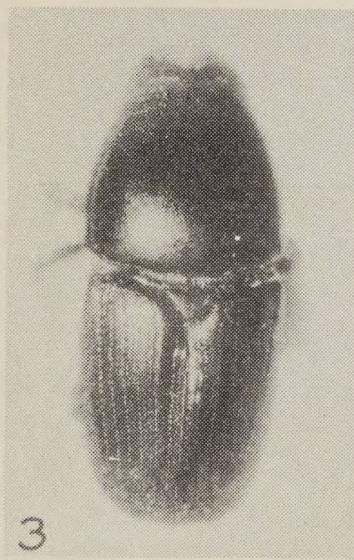
Figure 11. Dying elms.



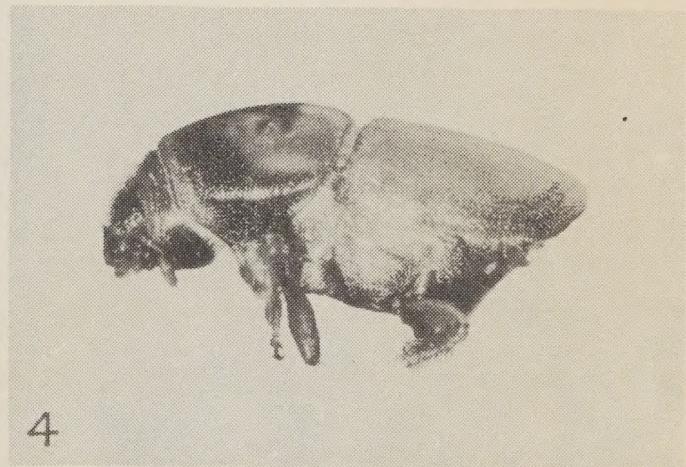
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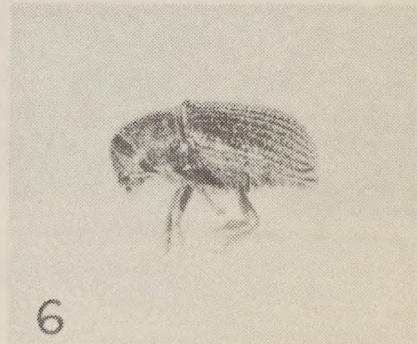
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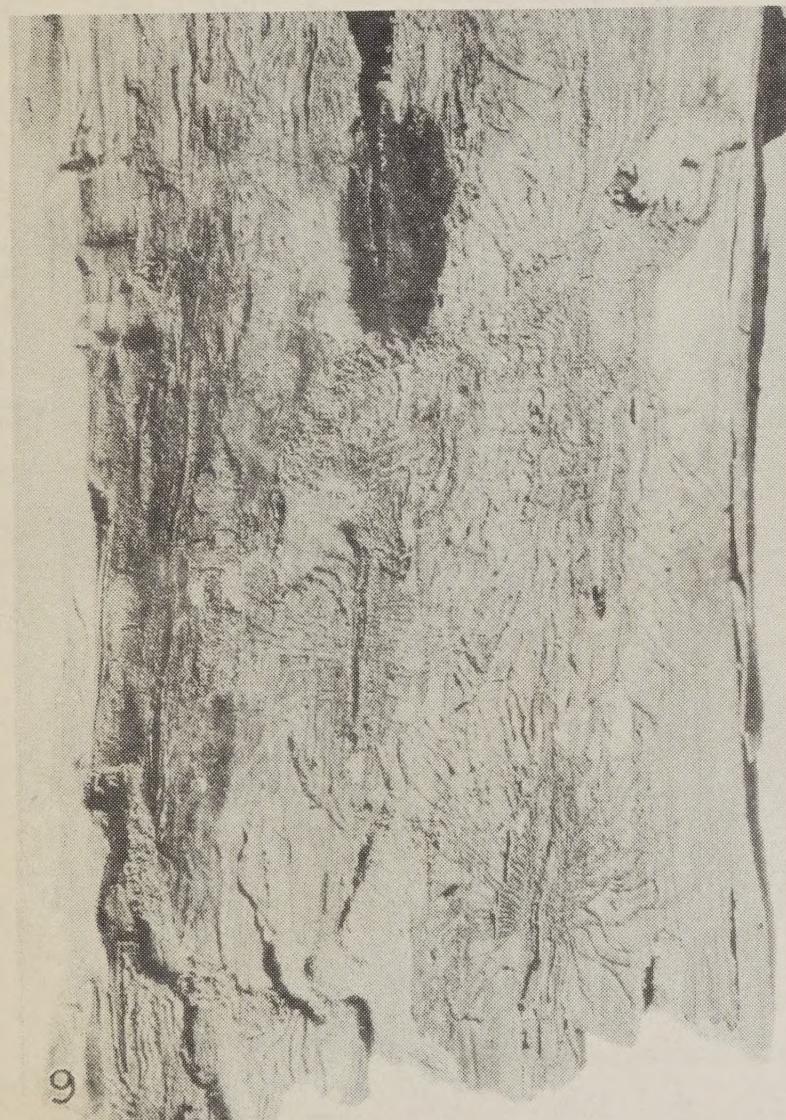
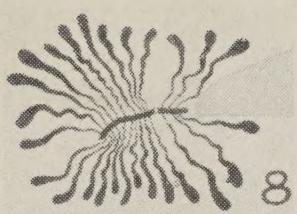
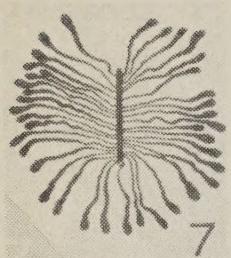


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